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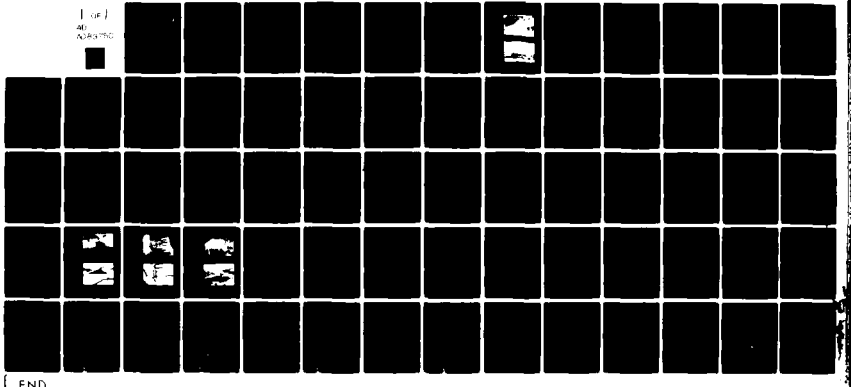

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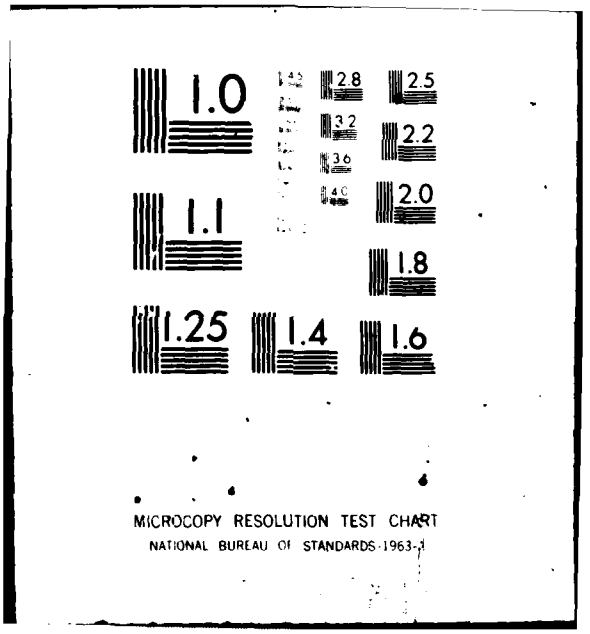
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OHIO RIVER BASIN
UNNAMED TRIBUTARY OF TWO LICK CREEK, INDIANA COUNTY

PENNSYLVANIA

SAMPLE RUN DAM

NDI I.D. NO:PA-00284
DER I.D. NO: 32-14

AD A083750

DTIC ELECTE APR 24 1980 S C D

LEVEL II

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

PREPARED FOR

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF ENGINEERS
BALTIMORE, MARYLAND 21203

DACW 31-80-C-0022

BY

D'APPOLONIA CONSULTING ENGINEERS
10 DUFF ROAD
PITTSBURGH, PA. 15235

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PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Department of the Army, Office of Chief of Engineers, Washington, D.C. 20314.

The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon visual observations and review of available data. Detailed investigations and analyses involving topographic mapping, subsurface investigations, material testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the inspection is intended to identify any need for such studies which should be performed by the owner.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of the dam depends on numerous and constantly changing internal and external factors which are evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

The assessment of the conditions and recommendations was made by the consulting engineer in accordance with generally and currently accepted engineering principles and practices.

(6) National Dam Inspection Program. Sample Run Dam (NDI I.D. No. PA-02324, DER I.D. No. 32-14), Conemaugh River Basin, Unnamed Tributary to Two Lick Creek, Indiana County, Pennsylvania. Phase I Inspection Report,

PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM

(10) Interim/Final

(11) 1/1980

(12) 671

NAME OF DAM: Sample Run Dam
STATE LOCATED: Pennsylvania
COUNTY LOCATED: Indiana
STREAM: Sample Run, a Tributary of Two Lick Creek
SIZE CLASSIFICATION: Small
HAZARD CLASSIFICATION: High
OWNER: Clearfield Coal Company
DATE OF INSPECTION: November 30 and December 28, 1979

(15) [illegible]

ASSESSMENT: Based on the evaluation of the existing conditions, the condition of Sample Run Dam is considered to be poor. The dam is abandoned and is in complete disrepair. A valve house located at the downstream toe of the dam has collapsed, covering most of the operating equipment with rubble. A reinforced concrete wall on the upstream side, which provides erosion protection for the embankment, has partially collapsed. The crest of the embankment is irregular and up to one foot below the design crest level. At some locations, the concrete in the spillway structures was found to be seriously deteriorated.

In view of these deficiencies, it is recommended that the condition of the dam be more completely evaluated by a professional engineer and plans be prepared and implemented for the repair and restoration of the embankment, spillway, and outlet works structures or orderly abandonment.

The flood discharge capacity of the dam was evaluated according to the recommended procedure and was found to pass 20 percent of the probable maximum flood (PMF) which is less than the recommended spillway capacity range of 50 percent to full PMF. For 50 percent of the PMF, it was found that the low spot on the embankment would be overtopped for a duration of 4.3 hours with a maximum depth of 0.5 foot. The overtopping depth and duration are not considered to present a significant breaching potential. Therefore, according to the recommended criteria, the capacity of the spillway is rated to be inadequate, but not seriously inadequate. A further analysis indicates that if the low spot on the crest of the dam were to be filled, the spillway capacity would be about 50 percent of the PMF.

The following recommendations should be implemented immediately or on a continuing basis:

1. The owner should immediately retain a professional engineer to prepare and execute

411001

JRB

plans for the repair and restoration of the embankment, spillway structures, and outlet facilities or develop a procedure for orderly abandonment of the dam. Repair and restoration should include, but not be limited to, the following work:

a. Restore the regulating facilities in the valve house to a working order and develop a means for upstream control on all the pipes through the embankment.

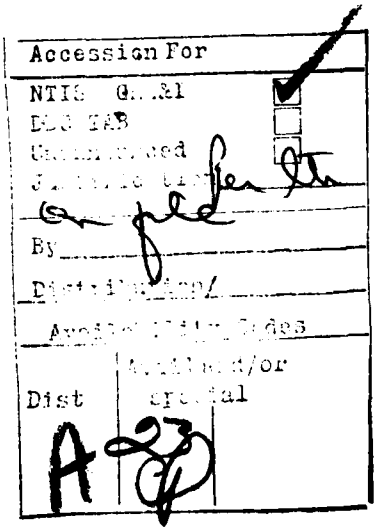
b. Conduct additional studies to more accurately ascertain the spillway capacity and the nature and extent of improvements required to provide adequate spillway capacity. Filling of the low areas on the crest of the dam should be considered in conjunction with this study.

c. Repair the concrete wall on the upstream side of the dam.

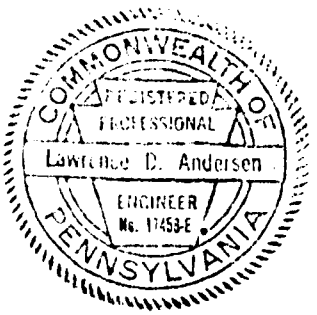
d. Repair deteriorating concrete in the spillway structures.

e. Clear brush and trees on the embankment.

2. Around-the-clock surveillance should be provided during unusually heavy runoff and a formal warning system should be developed to alert the downstream residents in the event of emergencies.



3. The dam and appurtenant structures should be inspected regularly and necessary maintenance performed.



Lawrence D. Andersen, P.E.
Vice President

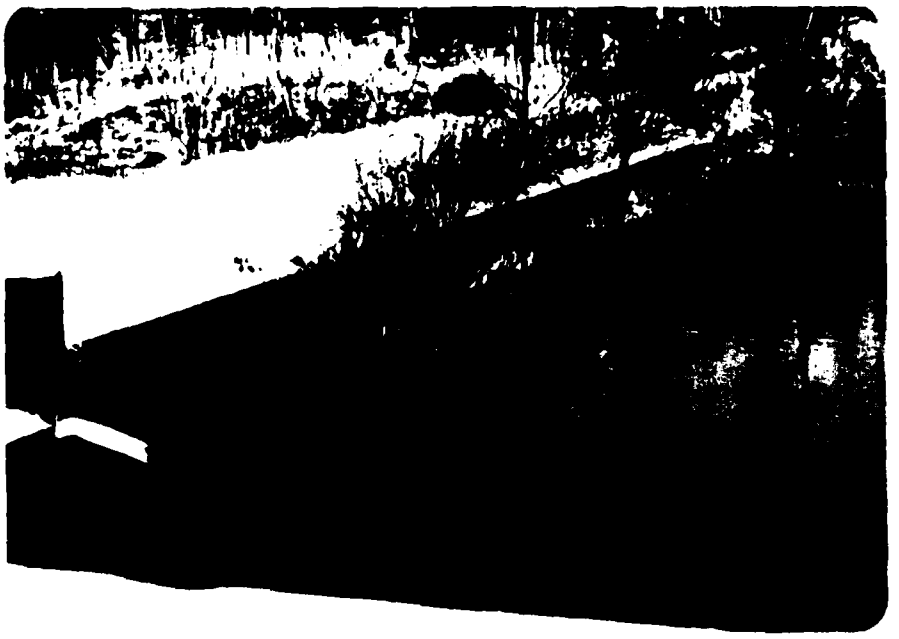
March 5, 1980
Date

Approved by:

JAMES W. PECK
Colonel, Corps of Engineers
District Engineer

31 March 1980
Date

SAMPLE RUN DAM
NDI I.D. PA-284
NOVEMBER 30, 1979



Upstream Face

Downstream Face

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PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM
SAMPLE RUN DAM
NDI I.D. PA-284
DER I.D. 32-14

SECTION 1
PROJECT INFORMATION

1.1 General

a. Authority. The inspection was performed pursuant to the authority granted by The National Dam Inspection Act, Public Law 92-367, to the Secretary of the Army, through the Corps of Engineers, to conduct inspections of dams throughout the United States.

b. Purpose. The purpose of this inspection is to determine if the dam constitutes a hazard to human life or property.

1.2 Description of Project

a. Dam and Appurtenances. Sample Run Dam consists of an earth embankment approximately 325 feet long with a maximum height of approximately 23 feet from the downstream toe. The crest width is approximately 10 feet. As designed, the downstream face of the dam was to be protected by grass, and a vertical concrete wall on the upstream side was to provide shoreline protection. Presently, the downstream face of the dam is covered with brush and trees up to 10 feet high and the concrete wall on the upstream side has partially collapsed.

The flood discharge facilities for the reservoir consist of a concrete overflow structure located on the left abutment (looking downstream). The spillway structures are comprised of an 18-foot-wide concrete ogee overflow section which discharges into an 18-foot-long concrete channel, incorporating an energy dissipator sill.

The dam was originally constructed for industrial water supply with outlet facilities incorporating low-level and high-level supply water intakes in addition to a low-level reservoir blow-off pipe. The blow-off and the low-level outlet pipes are shown to be 24-inch cast-iron pipes founded on concrete cradles. The design drawings show these pipes to be equipped with wrought iron cutoff collars encased in concrete. The high-level intake pipe consists of a 16-inch cast-iron pipe receiving flow from an intake structure located on the upstream side of the dam about 100 feet from the

right abutment. The invert of the high-level intake pipe is located about 2 feet below the spillway crest level. Presently, the high-level intake pipe serves as a primary spillway maintaining the normal pool level below the crest of the overflow spillway. To the extent that can be determined, flow through the low-level outlet and blow-off pipes is controlled by valves located in a valve house downstream of the dam. The valve house has collapsed, burying the operating equipment under rubble. As it presently exists, the dam has no functional emergency drawdown facilities.

b. Location. Sample Run Dam is located on Sample Run, approximately one mile upstream from its confluence with Two Lick Creek in Cherry Hill Township, Indiana County, Pennsylvania. Plate 1 illustrates the location of the dam.

c. Size Classification. Small (based on 23-foot height and 37 acre-feet maximum storage capacity).

d. Hazard Classification. The dam is classified to be in the high hazard category. An industrial equipment storage yard, a warehouse, and one residence are estimated to be within the potential flood plain of the dam. It is estimated that failure of the dam would cause loss of a few lives and some property damage.

e. Ownership. Clearfield Coal Company (address: c/o Mr. H. B. Kramp, Property Manager, Barnes and Tucker Company, 1912 Chestnut Avenue, Barnesboro, Pennsylvania 15714).

f. Purpose of Dam. The dam was built for the purpose of industrial supply, but presently the dam has reportedly been abandoned.

g. Design and Construction History. The dam was designed and constructed by Clearfield Coal Company in 1916. In 1930, the dam was enlarged by the same company to its present configuration.

h. Normal Operating Procedure. As it presently exists, the reservoir is normally maintained at the invert level of the high-level intake pipe which is functioning as a primary spillway. The invert of the high-level intake pipe is located about 2.3 feet below the crest level of the overflow spillway. Inflow in excess of the capacity of the high-level intake pipe would be discharged through the overflow spillway.

1.3 Pertinent Data

a. Drainage Area	0.3 square mile

b. Discharge at Dam Site (cfs)

Maximum known flood at dam site	Unknown
Outlet conduit at maximum pool	Not applicable[1]
Gated spillway capacity at maximum pool	<1[2]
Ungated spillway capacity at maximum pool	192
Total spillway capacity at maximum pool	192

c. Elevation (USGS Datum) (feet)

Top of dam	1349.1 (measured low spot); 1350 (as designed)
Maximum pool	1349.1
Normal pool	1344.7[3]
Upstream invert outlet works	Unknown
Downstream invert outlet works	Unknown
Streambed at center line of dam	1320±
Maximum tailwater	Unknown
Toe of dam	1326±

d. Reservoir Length (feet)

Normal pool level	500
Maximum pool level	550±

e. Storage (acre-feet)

Normal pool level	25
Maximum pool level	37

f. Reservoir Surface (acres)

Normal pool level	4.6
Maximum pool level	5±

g. Dam

Type	Earth
Length	325 feet
Height	23 feet
Top width	10 feet

(1) Visual observations indicate that the reservoir is significantly silted; therefore, the outlet pipe is not likely to be operable.

(2) Estimated capacity of high-level intake pipe.

(3) Invert elevation of high-level intake pipe.

Side slopes	Downstream: 2H:1V Upstream: 2H:1V
Zoning	No
Impervious core	Yes
Cutoff	Yes
Grout curtain	No

h. Regulating Outlet

Type	Two 24-inch cast-iron pipes[4]
Length	Unknown
Closure	Gate valves at downstream end
Access	Valve house
Regulating facilities	Gate valves

i. Spillway

Type	Ogee overflow section
Length	18 feet (perpendicular to flow)
Crest elevation	1347
Upstream channel	Lake
Downstream channel	Rectangular concrete channel

[4] Regulating facilities on 16-inch high-level intake pipe are dismantled.

SECTION 2
DESIGN DATA

2.1 Design

a. Data Available. The available data consist of files provided by the Commonwealth of Pennsylvania, Department of Environmental Resources (PennDER) which contain design drawings and specifications, past inspection reports, and correspondence.

(1) Hydrology and Hydraulics. A state report entitled, Report Upon the Application of the Clearfield Bituminous Coal Corporation, dated September 3, 1930, reports the design capacity of the spillway used during the enlargement of the dam in 1930.

(2) Embankment. The available information consists of design drawings, construction specifications, construction progress reports, and correspondence.

(3) Appurtenant Structures. The available information consists of design drawings.

b. Design Features

(1) Embankment. Review of the records indicates that Sample Run Dam was originally designed and constructed in 1916 and was later enlarged in 1930. Plate 2 illustrates a subsurface profile obtained from an investigation conducted for the original design. The valley is shown to consist of about 20 feet of clay underlain by foundation rock. A typical cross section of the original dam is illustrated in Plate 3. The dam is shown to consist of homogeneous fill with a 2 horizontal to 1 vertical slope on both the upstream and downstream faces and a concrete core wall along the upstream edge of the crest. Plate 3 also indicates that an embankment which existed prior to 1916 was also incorporated into the design, forming a portion of the downstream slope. Spillway details of the original design are illustrated in Plate 4. A report prepared by the state in 1916 on the review of the original design indicates that the concrete core wall was to be founded on adequately impervious material and was to extend beyond the limits of the embankment and the spillway into the abutments.

In 1930, the dam was enlarged to its current configuration. Plate 5 illustrates the details of this enlargement. The enlargement consisted of placing additional fill on the downstream face and crest of the dam to increase the crest level by about 4 feet. The spillway crest level was also increased. As illustrated in Plate 5, the concrete core wall was extended beyond the upstream slope of the dam to provide upstream slope protection against wave action.

(2) Appurtenant Structures. The appurtenant structures consist of an overflow spillway and outlet facilities. The spillway is an 18-foot-wide ogee-crested overflow section discharging into a rectangular concrete channel equipped with an energy dissipator sill.

The outlet facilities consist of low- and high-level supply pipes and a reservoir blow-off pipe. The layout of the reservoir blow-off pipe and low-level supply pipe is illustrated in Plate 3. Both pipes consist of 24-inch cast-iron pipes founded on concrete cradles. As shown in Plate 4, the pipes are equipped with wrought iron cutoff collars encased in concrete. It appears that the 16-inch high-level intake pipe was constructed during the enlargement of the dam in 1930. As it presently exists, this high-level intake pipe receives flow from an intake structure located on the upstream side of the dam, about 100 feet from the right abutment, and discharges into an earth channel about 50 feet from the toe of the dam. As illustrated in Plate 3, flow through the reservoir blow-off pipe and low-level supply pipe is controlled by valves located in the valve house.

c. Design Data

(1) Hydrology and Hydraulics. A 1930 state report indicates that the spillway was designed for a capacity of 280 cfs.

(2) Embankment. No engineering data are available on the design of the embankment.

(3) Appurtenant Structures. No design data are available on the appurtenant structures.

2.2 Construction. Available construction progress reports indicate that the original dam was constructed according to the design drawings. No unusual construction difficulties were reported.

Other than the 1930 enlargement of the dam as described above, available information indicates that no major post-construction changes have been made.

2.3 Operation. Available information includes no operating records for the dam.

2.4 Other Investigations. None reported.

2.5 Evaluation

a. Availability

(1) Hydrology and Hydraulics. The available information consists of the design discharge capacity of the spillway. This information is not considered to be adequate to assess the adequacy of the spillway.

(2) Embankment. The dam was apparently constructed according to the design drawings. In view of the age of the dam, completed in 1916 and later enlarged in 1930, the design approach and construction techniques are not likely to be in conformance with currently accepted engineering practices. The design lacks such considerations as embankment slope stability and seepage analysis and other quantitative data to aid in the assessment of the adequacy of design. However, the design incorporated a positive cutoff and concrete core wall, and it appears that the dam was constructed with adequate care. Based on the past performance of the dam, the design is considered to be adequate.

(3) Appurtenant Structures. Review of the design drawings indicates that no significant design deficiencies exist that would affect the overall performance of the appurtenant structures.

SECTION 3
VISUAL INSPECTION

3.1 Findings

a. General. The on-site inspection of Sample Run Dam consisted of:

1. Visual inspection of the embankment, abutments, and embankment toe.

2. Visual examination of the spillway structures and outlet facilities.

3. Evaluation of downstream area hazard potential.

The specific observations are illustrated in Plate 6.

b. Embankment. The general inspection of the embankment consisted of searching for indications of structural distress, such as cracks, subsidence, bulging, wet areas, seeps and boils, and observing general maintenance conditions, vegetative cover, erosion, and other surficial features.

In general, the condition of the embankment is considered to be poor. A portion of the reinforced concrete wall on the upstream side of the dam, which provides slope protection, was found to be collapsed. A segment of the downstream slope immediately behind the valve house appears to be creeping. It appears that this creeping slope has led to the collapse of the back wall of the valve house. A swampy area was found immediately below the valve house. However, it appears that the swampiness is caused by leaking pipes in the valve house. The downstream face and the crest of the dam were found to be covered with brush and trees.

The crest of the dam was surveyed relative to the spillway crest elevation; it was found that the crest in some locations is nearly one foot below the design elevation. The dam crest profile is illustrated in Plate 7. In the transverse direction, the crest of the dam was irregular. The average crest width was estimated to be 10 feet. The downstream slope was surveyed and was found to be reasonably within the 2 horizontal to 1 vertical design slope.

c. Appurtenant Structures. The spillway structures were examined for deterioration and other signs of distress and obstructions that would limit flow. The spillway structures were found to be in fair condition. However, at certain locations, serious concrete deterioration was observed.

Most of the operating facilities in the valve house are buried beneath the rubble of the collapsed wall and the roof of the valve house. Visible portions of the operating equipment indicate that the operating equipment is seriously corroded and leaking.

d. Reservoir Area. A map review and visual observations indicate that the watershed is predominantly covered by woodlands. No signs of landslide activity were observed. A review of the regional geology is included in Appendix F.

e. Downstream Channel. Below the dam, Sample Run flows along the toe of a coal mine refuse pile, then flows under Route 286 about 1/2 mile downstream from the dam and joins Two Lick Creek approximately one mile downstream. Further description of the downstream conditions is included in Section 1.2d.

3.2 Evaluation. The overall condition of the dam is considered to be poor. The embankment, spillway structures, and outlet facilities are in need of repair and restoration or orderly abandonment.

SECTION 4
OPERATIONAL FEATURES

4.1 Procedure. There are no formal operating procedures for the dam. As it presently exists, the reservoir is maintained at the invert elevation of the high-level intake pipe, which is functioning as the primary spillway.

4.2 Maintenance of the Dam. The dam has reportedly been abandoned and maintenance is nonexistent.

4.3 Maintenance of Operating Facilities. Most of the operating equipment is buried under the rubble of the collapsed valve house. Maintenance of the operating facilities is nonexistent.

4.4 Warning System. No formal warning system exists for the dam. Telephone communication facilities are available in the vicinity of the dam site.

4.5 Evaluation. The dam is in poor maintenance condition. It has reportedly been abandoned and no longer is maintained.

SECTION 5
HYDRAULICS AND HYDROLOGY

5.1 Evaluation of Features

a. Design Data. Sample Run Dam has a watershed of 0.3 square mile and impounds a reservoir with a surface area of 4.6 acres at normal pool level. The flood discharge facilities for the dam consist of an 18-foot-wide ogee-crested overflow section. The capacity of the spillway, based on the available 2.1 feet of freeboard relative to the low spot on the crest of the dam, was determined to be 192 cfs.

b. Experience Data. As previously stated, Sample Run Dam is classified as a small dam in the high hazard category. Under the recommended criteria for evaluating emergency spillway discharge capacity, such impoundments are required to pass half to full PMF. Based on small storage capacity, the one-half PMF is chosen as (SDF). The PMF inflow hydrograph for the reservoir was determined utilizing the Dam Safety Version of the HEC-1 computer program developed by the Hydrologic Engineering Center of the U.S. Army, Corps of Engineers. The data used for the computer analysis are presented in Appendix D. The one-half PMF and full PMF inflow hydrographs were found to have peak flows of 442 cfs and 884 cfs, respectively. Computer input and a summary of computer output are also included in Appendix D.

c. Visual Observations. On the date of inspection, no conditions were observed that would indicate that the capacity of the spillway would be significantly reduced in the event of a flood.

d. Overtopping Potential. Various percentages of PMF inflow hydrograph were routed through the reservoir, and it was found that the spillway can pass 20 percent of the PMF without overtopping the embankment. It was found that during the passage of 50 percent of the PMF, the dam would be overtopped for a duration of 4.3 hours with a maximum depth of 0.5 foot over the low spot on the crest of the dam. For full PMF, it was found that the overtopping depth would be 0.9 foot and the duration 7.7 hours. A further analysis, assuming the low sections on the crest of the dam to be filled to the design elevation, indicates that the spillway would pass 50 percent of the PMF without significantly overtopping the embankment.

e. Spillway Adequacy. The spillway was found to pass 20 percent of the PMF without overtopping the low spot on the crest of the dam. Overtopping of the low spot on the crest of the dam for a duration of 4.3 hours with a maximum depth of 0.5 foot during the passage of 50 percent of the PMF is not considered to create a significant breach potential. Therefore, the spillway capacity is classified to be inadequate, but not seriously inadequate.

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations

(1) Embankment. As discussed in Section 3, although numerous deficiencies were noted, none were considered to be serious relative to the overall stability of the dam at this time.

(2) Appurtenant Structures. Serious concrete deterioration was found in various locations of the spillway structures. However, none appeared to be a threat to the overall stability of the spillway structures. The outlet facilities are buried under the rubble of the collapsed valve house. Visible portions indicate that the outlet facilities are seriously corroded and leaking.

b. Design and Construction Data

(1) Embankment. The available information does not include any quantitative data to aid in the assessment of the structural stability of the dam. However, as previously noted, the dam appears to have been constructed with adequate care and structurally has performed satisfactorily since its construction. Therefore, based on visual observations, the static stability of the dam is considered to be adequate.

(2) Appurtenant Structures. Available information does not include adequate data to assess the structural adequacy of the appurtenant structures. The available data consist of design drawings only.

c. Operating Records. The structural stability of the dam is not considered to be affected by the operational features of the dam.

d. Post-Construction Changes. The dam was constructed in 1916 and was later enlarged in 1930. A description of this enlargement is included in Section 2.2.

e. Seismic Stability. The dam is located in Seismic Zone 1, and based on visual observations, the static stability of the dam appears to be adequate. Therefore, based on recommended criteria for the evaluation of seismic stability of dams, the structure is presumed to present no hazards from earthquakes.

SECTION 7
ASSESSMENT AND RECOMMENDATIONS/REMEDIAL MEASURES

7.1 Dam Assessment

a. Assessment. The visual observations indicate that Sample Run Dam is in poor condition. The dam has been abandoned and is not being maintained. The dam crest is irregular and up to about one foot below the design elevation. A portion of the downstream slope appears to be creeping. A portion of the reinforced concrete wall on the upstream side of the dam providing erosion protection has collapsed. The valve house also collapsed, burying the operating facilities under rubble. Sections of the concrete in the spillway structures are seriously deteriorated.

In view of the above conditions, it is recommended that the overall condition of the dam should be evaluated by a professional engineer to repair and restore the embankment, spillway structures, and outlet facilities or develop a procedure for orderly abandonment.

The spillway capacity was found to be less than the recommended spillway capacity range of 50 percent to full PMF; therefore, the spillway is classified as inadequate. However, it was not rated to be seriously inadequate.

b. Adequacy of Information. Available information, in conjunction with visual observations, is considered to be sufficient to make the following recommendations.

c. Urgency. The following recommendations should be implemented immediately or on a continuing basis.

d. Necessity for Additional Data. In view of the conditions described above, the owner should retain the services of a professional engineer to prepare and implement plans for the repair and restoration of the dam and to conduct additional hydrological and hydraulic analyses to provide adequate spillway capacity or develop a procedure for orderly abandonment.

7.2 Recommendations/Remedial Measures. It is recommended that the following recommendations be implemented immediately or on a continuing basis:

1. The owner should immediately retain a professional engineer to prepare and execute plans for the repair and restoration of the embankment, spillway structures, and outlet facilities or develop a procedure for orderly abandonment of the dam. Repair and

restoration should include, but not be limited to, the following work:

a. Restore the regulating facilities in the valve house to a working order and develop a means for upstream control on all the pipes through the embankment.

b. Conduct additional studies to more accurately ascertain the spillway capacity and the nature and extent of improvements required to provide adequate spillway capacity. Filling of the low areas on the crest of the dam should be considered in conjunction with this study.

c. Repair the concrete wall on the upstream side of the dam.

d. Repair deteriorating concrete in the spillway structures.

e. Clear brush and trees on the embankment.

2. Around-the-clock surveillance should be provided during unusually heavy runoff and a formal warning system should be developed to alert the downstream residents in the event of emergencies.

3. The dam and appurtenant structures should be inspected regularly and necessary maintenance performed.

APPENDIX A

CHECKLIST
VISUAL INSPECTION
PHASE I

APPENDIX A

CHECKLIST
VISUAL INSPECTION
PHASE I

NAME OF DAM Sample Run Dam COUNTY Indiana STATE Pennsylvania ID# NDI I.D. PA-284 DER I.D. 32-14

TYPE OF DAM Earth HAZARD CATEGORY High

DATE(S) INSPECTION November 30, 1979 WEATHER Cloudy TEMPERATURE 30s

POOL ELEVATION AT TIME OF INSPECTION 1344.7 M.S.L. TAILWATER AT TIME OF INSPECTION 1325± M.S.L.

INSPECTION PERSONNEL:

Bilgin Erel

Wah-Tak Chan

REVIEW INSPECTION PERSONNEL:
(December 28, 1979)

E. D'Appolonia

L. D. Andersen

J. H. Poellot

B. Erel

Bilgin Erel RECORDER

VISUAL INSPECTION
PHASE I
EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	A portion of the downstream slope behind the valve house appears to be creeping.	This condition should be periodically observed to determine if the condition is worsening.
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	See Plate 7 for dam crest profile.	
RIPRAP FAILURES	A reinforced concrete wall along the upstream side provides shoreline protection. A portion of the wall has collapsed.	This wall should be repaired.

VISUAL INSPECTION
PHASE I
EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	No signs of distress.	
ANY NOTICEABLE SEEPAGE	A swampy area is located below the valve house. However, the swampy area appears to be caused by leakage from the outlet pipes.	
STAFF GAGE AND RECORDER	None	
DRAINS	None	

VISUAL INSPECTION
PHASE I
OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	No portions of the outlet pipes are visible.	
INTAKE STRUCTURE	Submerged	
OUTLET STRUCTURE	The outlet pipe discharges into an earth channel. The pipe is partially blocked with debris.	The debris should be cleared.
OUTLET CHANNEL	An earth channel partially blocked by debris.	
EMERGENCY GATE	The valve house has collapsed, burying the operating equipment under rubble. None of the operating facilities appear to be functional.	Necessary repairs should be made to restore the outlet facilities to a functional condition.

VISUAL INSPECTION
PHASE I
UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	Eighteen-foot-wide concrete ogee overflow section. In fair condition.	
APPROACH CHANNEL	Submerged. Appears to be free of debris.	
DISCHARGE CHANNEL	An 18-foot-long rectangular concrete channel discharging into an earth channel. Concrete in portions of the discharge channel is seriously deteriorated.	Deteriorating concrete in the spillway structures should be repaired.
BRIDGE AND PIERS	None	

VISUAL INSPECTION
PHASE I
GATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	Not applicable	
APPROACH CHANNEL	Not applicable	
DISCHARGE CHANNEL	Not applicable	
BRIDGE PIERS	Not applicable	
GATES AND OPERATION EQUIPMENT	Not applicable	

VISUAL INSPECTION
PHASE I
INSTRUMENTATION

VISUAL EXAMINATION OF	OBSERVATIONS	*REMARKS OR RECOMMENDATIONS*
MONUMENTATION/SURVEYS	None	
OBSERVATION WELLS	None	
WEIRS	None	
PIEZOMETERS	None	
OTHER	None	

VISUAL INSPECTION
PHASE I
RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Moderately steep to steep. No significant shoreline erosion was noted.	
SEDIMENTATION	The reservoir appears to be significantly silted.	
UPSTREAM RESERVOIRS	None	

VISUAL INSPECTION
PHASE I
DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	There are no obstructions downstream from the dam that would affect the discharge capacity of the spillway.	
SLOPES	No features pertinent to the safety of the dam.	
APPROXIMATE NUMBER OF HOMES AND POPULATION	One industrial warehouse and a residence are likely to be in the potential flood plain. Population: approximately 10.	

APPENDIX B

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
AND HYDROLOGIC AND HYDRAULIC
PHASE I

APPENDIX B

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM Sample Run Dam
ID# NDI I.D. PA-284
DER I.D. 32-14

ITEM	REMARKS
AS-BUILT DRAWINGS	The drawings are available in the state files.
REGIONAL VICINITY MAP	See Plate 1.
CONSTRUCTION HISTORY	The dam was designed and constructed by the Clearfield Bituminous Coal Company in 1916. The dam was enlarged in 1930.
TYPICAL SECTIONS OF DAM	See Plates 3 and 5.
OUTLETS - PLAN - DETAILS - CONSTRAINTS - DISCHARGE RATINGS	See Plates 3, 4, and 5.

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

ITEM	REMARKS
RAINFALL/RESERVOIR RECORDS	Not maintained
DESIGN REPORTS	None available
GEOLOGY REPORTS	None available (see Plate 2 for subsurface profile).
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	None available
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	See Plate 2 for the typical subsurface profile.

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

ITEM	REMARKS
POST CONSTRUCTION SURVEYS OF DAM	None reported
BORROW SOURCES	Unknown
MONITORING SYSTEMS	None
MODIFICATIONS	The dam was enlarged in 1930.
HIGH POOL RECORDS	Not recorded

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

ITEM	REMARKS
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None reported
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None reported
MAINTENANCE OPERATION RECORDS	Not maintained
SPILLWAY PLAN SECTIONS DETAILS	See Plates 4 and 5.
OPERATING EQUIPMENT PLANS AND DETAILS	See Plate 3.

CHECKLIST
ENGINEERING DATA
HYDROLOGIC AND HYDRAULIC

DRAINAGE AREA CHARACTERISTICS: 0.3 square miles

ELEVATION, TOP OF NORMAL POOL AND STORAGE CAPACITY: 1347[1] (25 acre-feet)

ELEVATION, TOP OF FLOOD CONTROL POOL AND STORAGE CAPACITY: 1349.1 (37 acre-feet)

ELEVATION, MAXIMUM DESIGN POOL: 1350 (design crest elevation)

ELEVATION, TOP OF DAM: 1349.1 (measured low spot)

SPILLWAY:

a. Elevation 1347

b. Type Concrete ogee overflow section

c. Width 18 feet

d. Length Not applicable

e. Location Spillover Adjacent to spillway

f. Number and Type of Gates None

OUTLET WORKS:

a. Type Two 24-inch cast-iron pipes

b. Location Center of embankment

c. Entrance Inverts Unknown

d. Exit Inverts Unknown

e. Emergency Drawdown Facilities None functional at this time

HYDROMETEOROLOGICAL GAGES:

a. Type None

b. Location None

c. Records None

MAXIMUM NONDAMAGING DISCHARGE: 192 cfs (existing spillway capacity)

---

[1] Overflow spillway crest level.

APPENDIX C

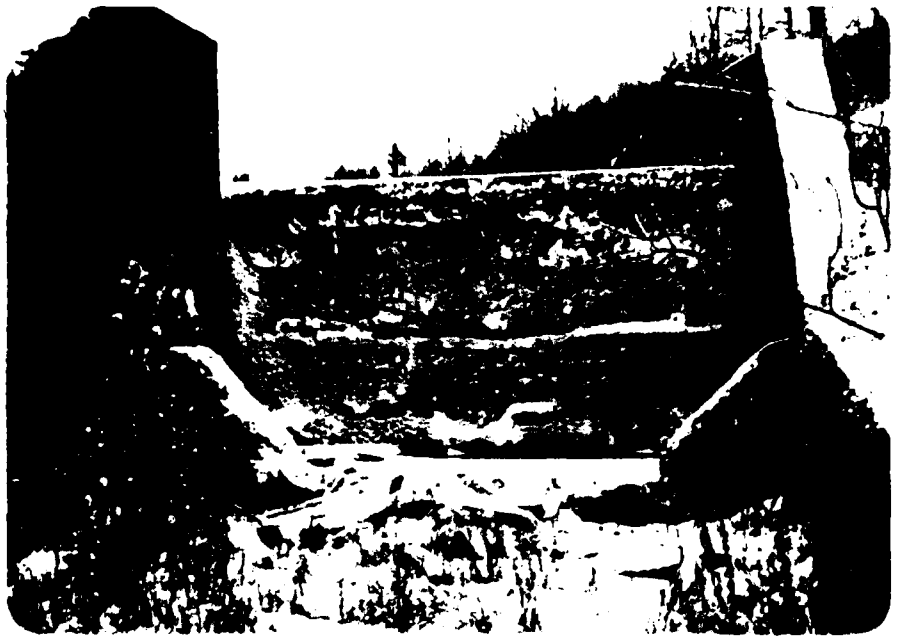
PHOTOGRAPHS

LIST OF PHOTOGRAPHS
SAMPLE RUN DAM
NDI I.D. PA-284
NOVEMBER 30, 1979

PHOTOGRAPH NO.	DESCRIPTION
1	Crest (looking east).
2	Overflow spillway and dam crest (looking west).
3	Overflow spillway (looking upstream).
4	Primary spillway intake.
5	Valve house (collapsed).
6	Flood plain (view from dam crest).

Photograph No. 1
Crest (looking east).

Photograph No. 2
Overflow spillway and dam crest (looking west).

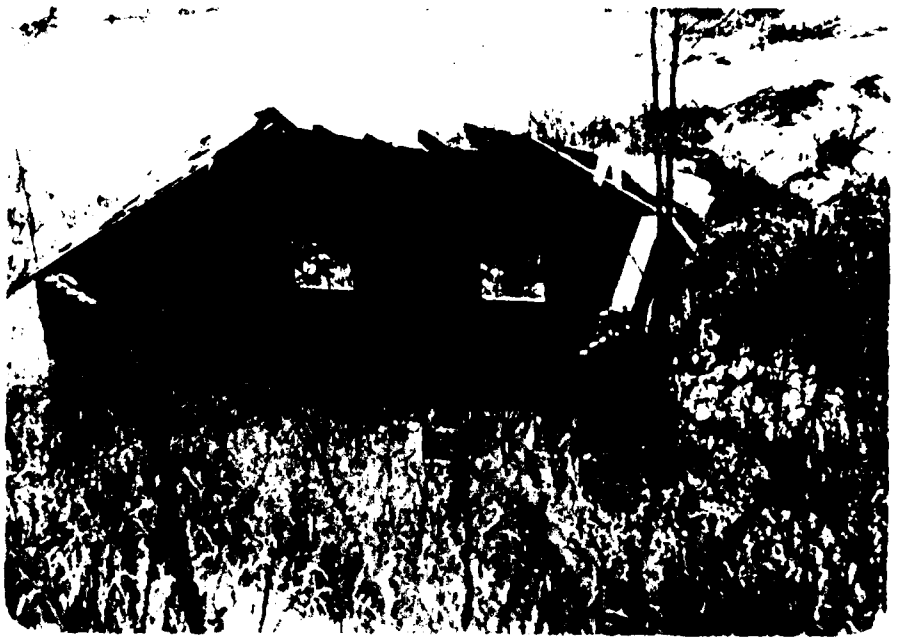


Photograph No. 3

(West on spillway looking upstream).

Photograph No. 4

Primary spillway intake.



Photograph No. 5

Valve house (collapsed).

Photograph No. 6

Flood plain (view from [illegible]).

APPENDIX D

HYDROLOGY AND HYDRAULICS ANALYSES

HYDROLOGY AND HYDRAULIC ANALYSIS
DATA BASE

NAME OF DAM: Sample Run Dam (NDI I.D. PA-284)

PROBABLE MAXIMUM PRECIPITATION (PMP) = 23.7 INCHES/24 HOURS[1]

STATION	1	2	3	4	5
Station Description	Reservoir	Dam			
Drainage Area (square miles)	0.33	-			
Cumulative Drainage Area (square miles)	0.33	0.33			
Adjustment of PMF for Drainage Area (%)[2]	Zone 7				
6 Hours	102	-			
12 Hours	120	-			
24 Hours	130	-			
48 Hours	140	-			
72 Hours	-	-			
Snyder Hydrograph Parameters					
Zone[3]	24	-			
C_p/C_t[4]	0.45/1.6	-			
L (miles)[5]	0.8	-			
L_{ca} (miles)[5]	0.4	-			
$t_p = C_t(L \cdot L_{ca})^{0.3}$ (hours)	1.14	-			
Spillway Data					
Crest Length (ft)	-	18.0			
Freeboard (ft)	-	2.1			
Discharge Coefficient	-	3.5			
Exponent	-	1.5			

[1] Hydrometeorological Report 33 (Figure 1), U.S. Army, Corps of Engineers, 1956.

[2] Hydrometeorological Report 33 (Figure 2), U.S. Army, Corps of Engineers, 1956.

[3] Hydrological zone defined by Corps of Engineers, Baltimore District, for determining Snyder's Coefficients (C_p and C_t).

[4] Snyder's Coefficients.

[5] L = Length of longest water course from outlet to basin divide.
L_{ca} = Length of water course from outlet to point opposite the centroid of drainage area.

STORAGE VS. ELEVATION

ELEVATION	ΔH, FEET	AREA (ACRES)[1]	ΔVOLUME (ACRE-FEET)[2]	STORAGE (ACRE-FEET)
1360	13.0	7.3	76.7	101.3
1347.0	21[4]	4.6	24.6[3]	24.6
Reservoir Bottom		-		0

[1] Planimetered from USGS maps.

[2] $\Delta Volume = \Delta H/3 \ (A_1 + A_2 + \sqrt{A_1 A_2})$.

[3] From PennDER files.

[4] From field survey, 11-30-79.

```
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  17 JAN 80
*********************************
    1                A1       SNYDER UNIT HYDROGRAPH,FLOOD ROUTING AND DAM OVERTOPPING ANALYSES
    2                A2       SAMPLE RUN DAM,INDIANA COUNTY. NDI-I.D.PA.284        PROJECT NO.79-543-17
    3                A3       FOR 20%,30%,40%,50%,60%,70%,80%,90%, AND 100% PMF
    4                B    300         0        10         0         0         0         0         0        -4         0
    5                B1     5
    6                J      1         9         1
    7                J1  0.20      0.30      0.40      0.50      0.60      0.70      0.80      0.90      1.00
    8                K      0         1                                                1
    9                K1       CALCULATION OF SNYDER INFLOW HYDROGRAPH TO SAMPLE RUN DAM
   10                M      1         1      0.33                 0.33                                    1
   11                P               23.7       102       120       130       140
   12                T                                                                 1.0       .05              0.0216
   13                W   1.14      0.45
   14                X   -1.0     -0.05       2.0
   15                K      1         2                                                1
   16                K1       ROUTING FLOW THROUGH SAMPLE RUN DAM (NDI-I.D.PA.284)
   17                Y                                          1         1
   18                Y1     1                                                      -1347.0
   19                SS    0.0      24.6     101.3
   20                SE 1326.0    1347.0    1360.0
   21                SS 1347.0     18.00      3.50       1.5
   22                SD 1349.1      3.08       1.5     325.0
   23                SL    50.0     100.0     200.0     250.0     275.0     288.0     325.0
   24                SV 1349.1    1349.2    1349.3    1349.5    1349.6    1349.7    1349.8
   25                K     99
```

COMPUTER INPUT OVERTOPPING ANALYSIS

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 .20	RATIO 2 .30	RATIO 3 .40	RATIO 4 .50	RATIO 5 .60	RATIO 6 .70	RATIO 7 .80	RATIO 8 .90	RATIO 9 1.00
HYDROGRAPH AT	1	.33	1	177.	265.	354.	442.	530.	619.	707.	795.	884.
	(	.85)	(	5.01)(	7.51)(	10.01)(	12.51)(	15.02)(	17.52)(	20.02)(	22.52)(	25.03)
ROUTED TO	2	.33	1	159.	256.	351.	441.	529.	618.	706.	795.	883.
	(	.85)	(	4.51)(	7.25)(	9.95)(	12.48)(	14.99)(	17.50)(	20.00)(	22.51)(	25.01)

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1347.00	1347.00	1349.10
STORAGE	25.	25.	37.
OUTFLOW	0.	0.	192.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUP STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.20	1348.86	0.00	36.	159.	0.00	41.33	0.00
.30	1349.32	.22	38.	256.	2.33	41.00	0.00
.40	1349.48	.38	39.	351.	3.33	40.83	0.00
.50	1349.60	.50	40.	441.	4.33	40.83	0.00
.60	1349.69	.59	40.	529.	5.33	40.83	0.00
.70	1349.78	.68	41.	618.	6.00	40.83	0.00
.80	1349.85	.75	41.	706.	6.67	40.83	0.00
.90	1349.92	.82	42.	795.	7.17	40.83	0.00
1.00	1349.99	.89	42.	883.	7.67	40.83	0.00

OVERTOPPING ANALYSIS SUMMARY

```
**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION     JULY 1978
  LAST MODIFICATION  17 JAN 80
**********
    1                A1       SNYDER UNIT HYDROGRAPH,FLOOD ROUTING AND DAM OVERTOPPING ANALYSES
    2                A2       SAMPLE RUN DAM,INDIANA COUNTY. NDI-I.D.PA.284        PROJECT NO.79-543-17
    3                A3       FOR 20%,30%,40%,50%,60%,70%,80%,90%, AND 100% PMF [illegible] EL 1350.00
    4                B    300        0       10        0        0        0        0        0       -4        0
    5                B1     5
    6                J      1        9        1
    7                J1  0.20     0.30     0.40     0.50     0.60     0.70     0.80     0.90     1.00
    8                K      0        1                                          1
    9                K1       CALCULATION OF SNYDER INFLOW HYDROGRAPH TO SAPPLE RUN DAM
   10                M      1        1     0.33              0.33                                 1
   11                P              23.7      102      120      130      140
   12                T                                                        1.0      .05            0.0216
   13                W   1.14     0.45
   14                X   -1.0    -0.05      2.0
   15                K      1        2                                          1
   16                K1       ROUTING FLOW THROUGH SAMPLE RUN DAM (NDI-I.D.PA.284) [illegible] TO EL 1350.00
   17                Y                                        1        1
   18                Y1     1                                                -1347.0
   19                SS   0.0      4.6    101.3
   20                SE1326.0   1347.0   1360.0
   21                SS1347.0     18.0      3.5      1.5
   22                SD1350.0      3.0      1.5    325.0
   23                SL 325.0
   24                SV1350.0
   25                K     99
```

COMPUTER INPUT FLOOD ROUTING
(USING DESIGN CREST ELEVATION)

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1347.00	1347.00	1350.00
STORAGE	5.	5.	27.
OUTFLOW	0.	0.	327.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.20	1348.82	0.00	18.	154.	0.00	41.67	0.00
.30	1349.41	0.00	23.	236.	0.00	41.50	0.00
.40	1349.94	0.00	26.	318.	0.00	41.50	0.00
.50	1350.18	.18	28.	433.	2.00	41.00	0.00
.60	1350.29	.29	29.	528.	2.83	40.83	0.00
.70	1350.37	.37	30.	617.	3.50	40.83	0.00
.80	1350.45	.45	30.	706.	4.00	40.83	0.00
.90	1350.52	.52	31.	794.	4.50	40.83	0.00
1.00	1350.59	.59	31.	883.	5.00	40.83	0.00

OVERTOPPING ANALYSIS SUMMARY
(USING DESIGN CREST ELEVATION)

APPENDIX E

PLATES

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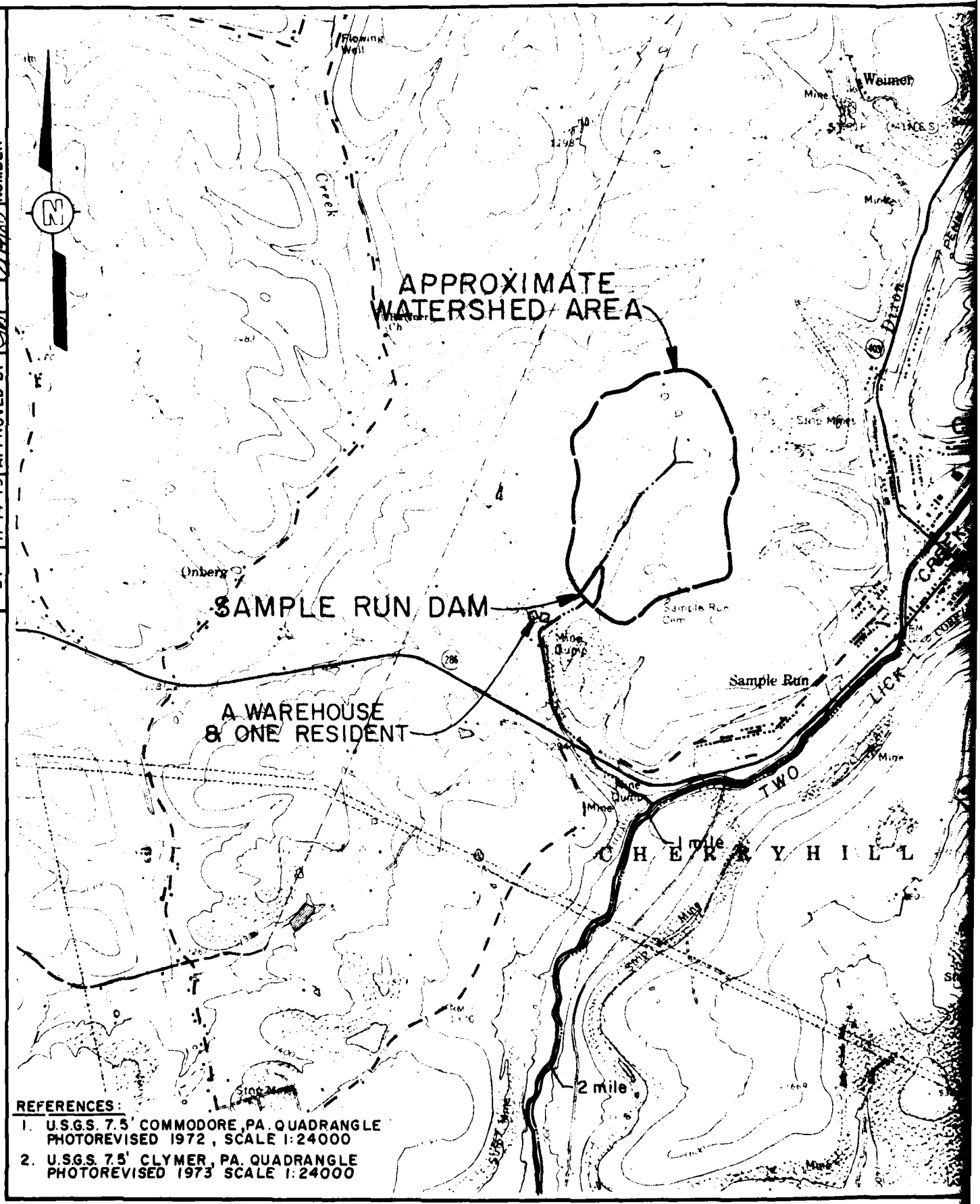
	11-14-79	APPROVED BY		79-543-B33



REFERENCES:

1. U.S.G.S. 7.5' COMMODORE, PA. QUADRANGLE PHOTOREVISED 1972, SCALE 1:24000
2. U.S.G.S. 7.5' CLYMER, PA. QUADRANGLE PHOTOREVISED 1973 SCALE 1:24000

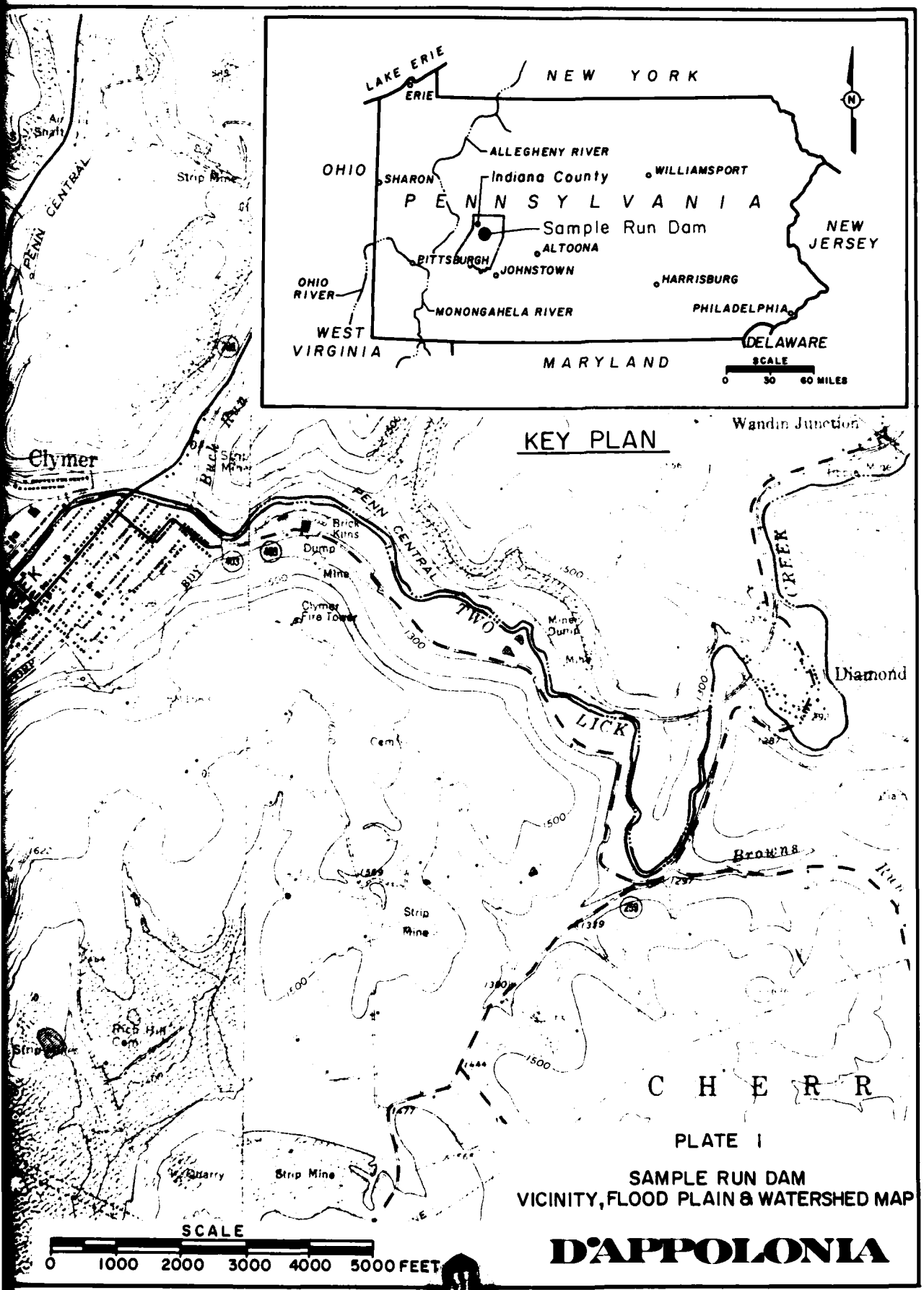


PLATE I

SAMPLE RUN DAM
VICINITY, FLOOD PLAIN & WATERSHED MAP

D'APPOLONIA

2

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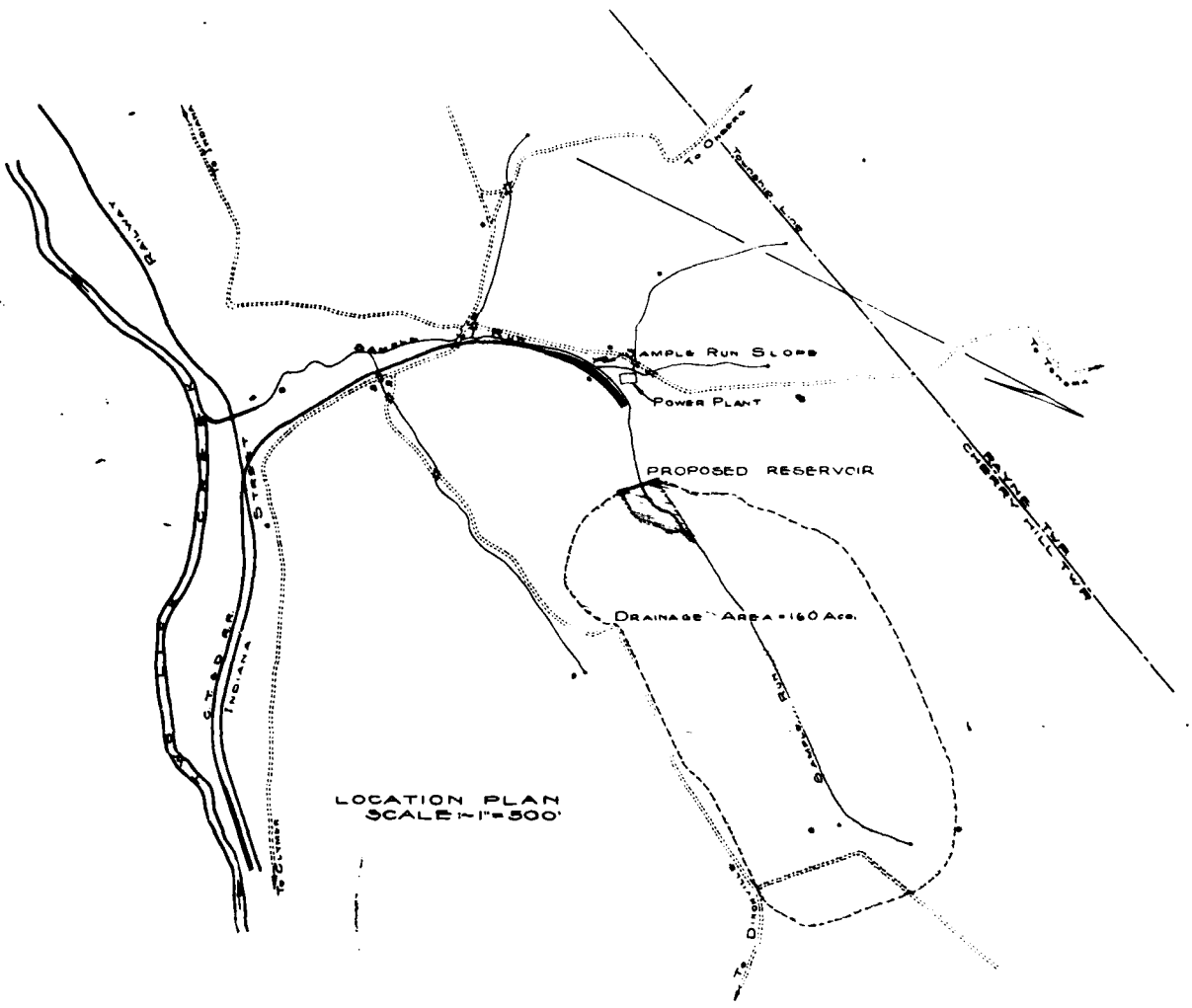
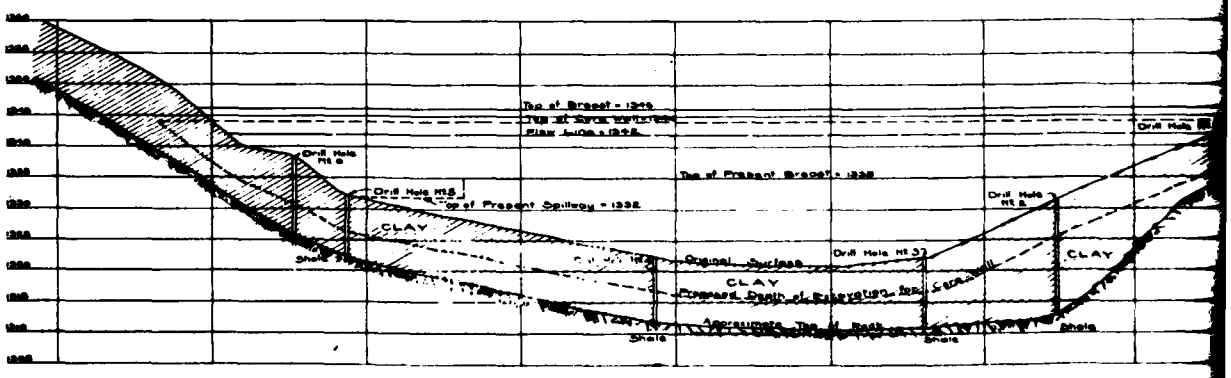
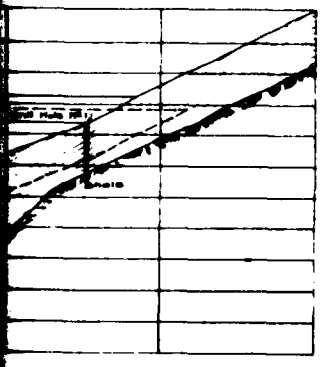
	11-14-79	APPROVED BY		



LOCATION PLAN
SCALE 1" = 500'



LONGITUDINAL SECTION
Looking Down Stream
SCALES 1" = (Hor 1" = 50'
Ver 1" = 10'



LOCATION PLAN AND
LONGITUDINAL SECTION
OF RESERVOIR
FOR POWER PLANT
CLYMER, PA.

CLEARFIELD BITUMINOUS COAL CORP'N

SCALES AS SHOWN APRIL 1916

REVISED	
REVISED	
REVISED	
DRAWN BY — F.K.P. & C.E.B.	
APPROVED —	
1	CHIEF ENGINEER

PLATE 2

D'APPOLONIA

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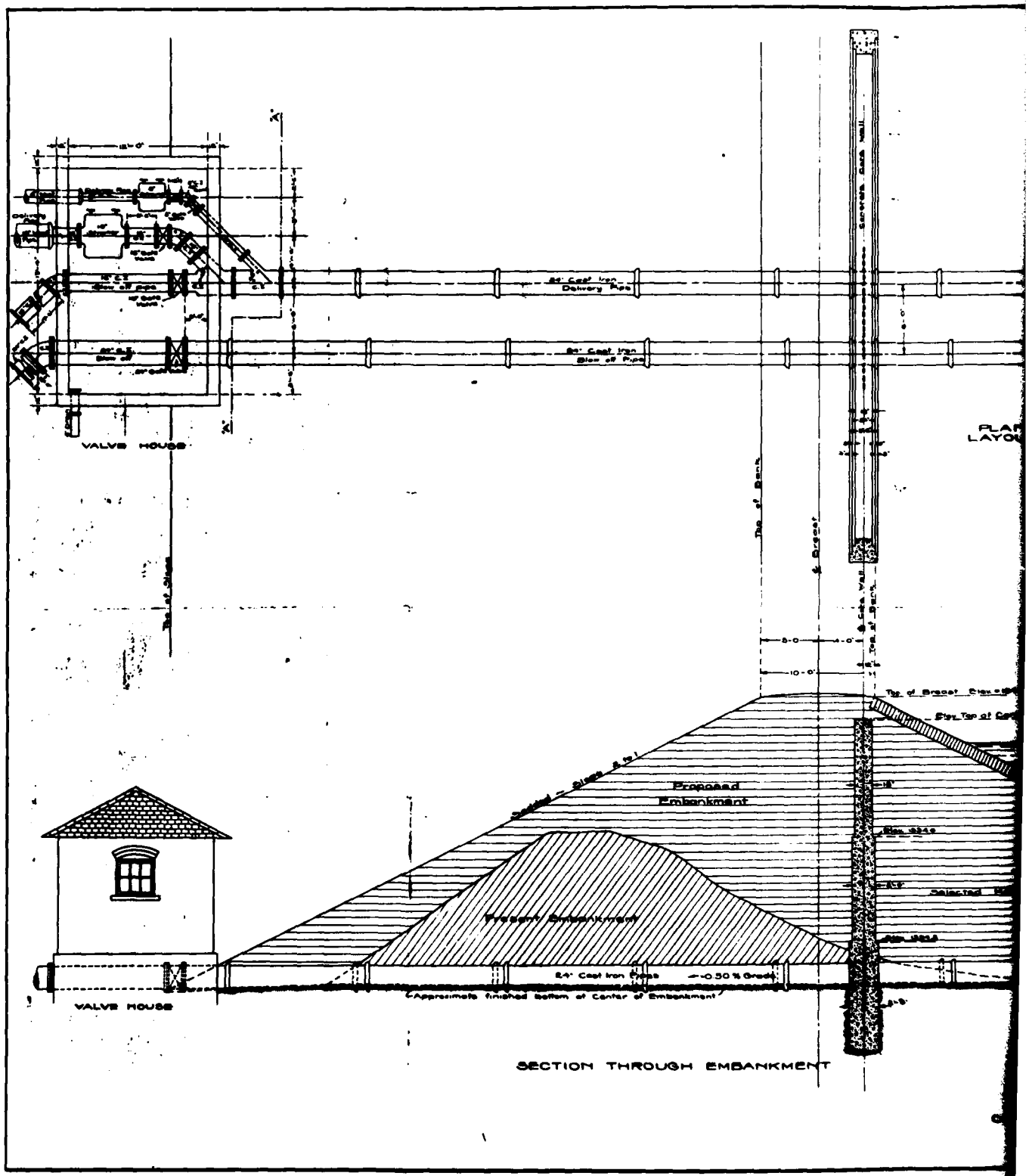
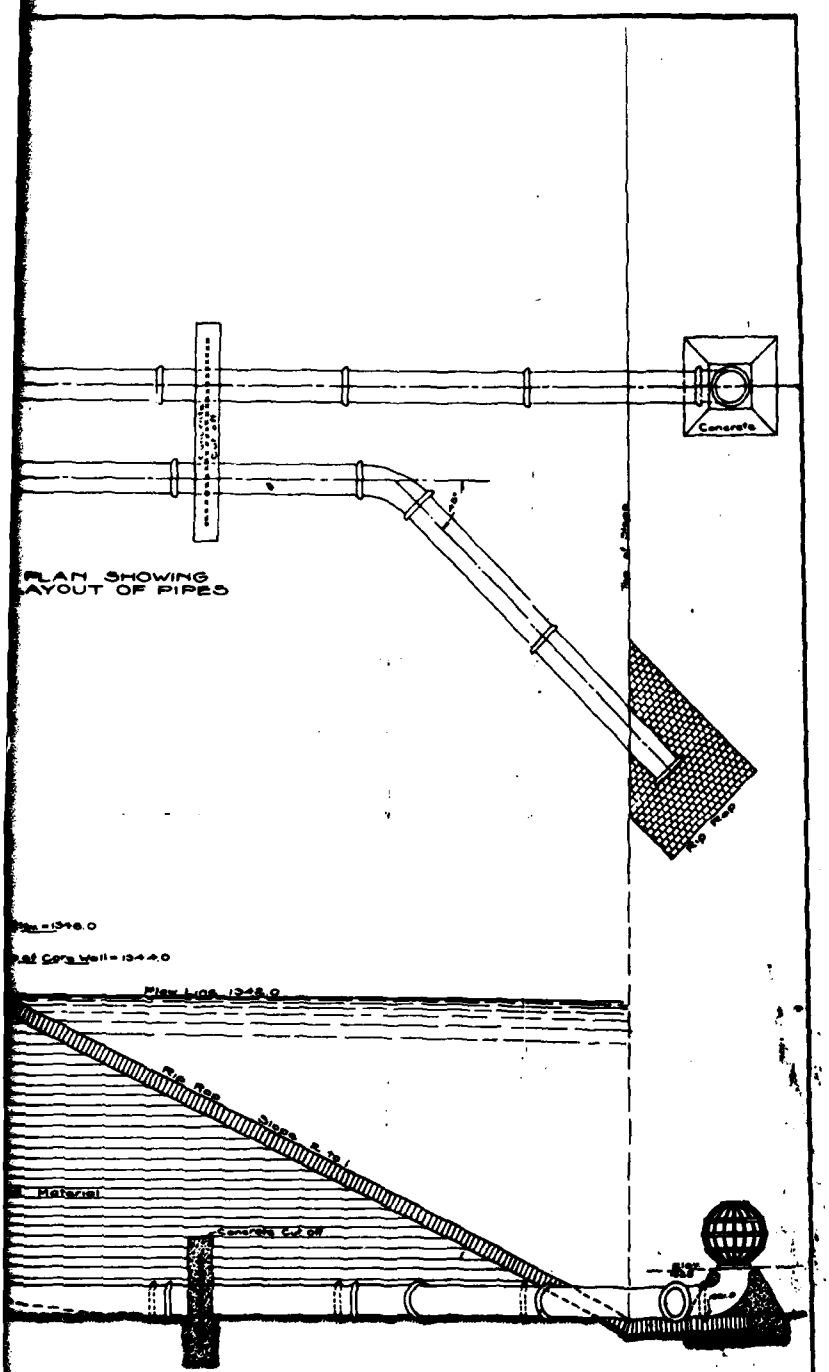
	11-14-79	APPROVED BY		





PLAN OF RESERVOIR
FOR POWER PLANT
CLYMER, PA.
CLEARFIELD BITUMINOUS COAL CORP'N
SCALE:- 1" = 1' MCH. 1916

REVISED	5-9-16
REVISED	
REVISED	

DRAWN BY:- F. R. PROSSER
APPROVED:-
CHIEF ENGINEER

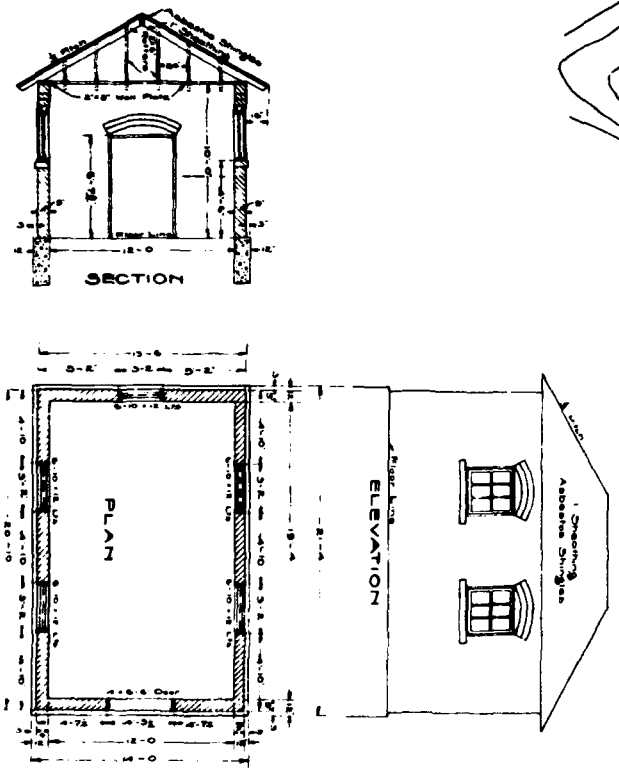
2

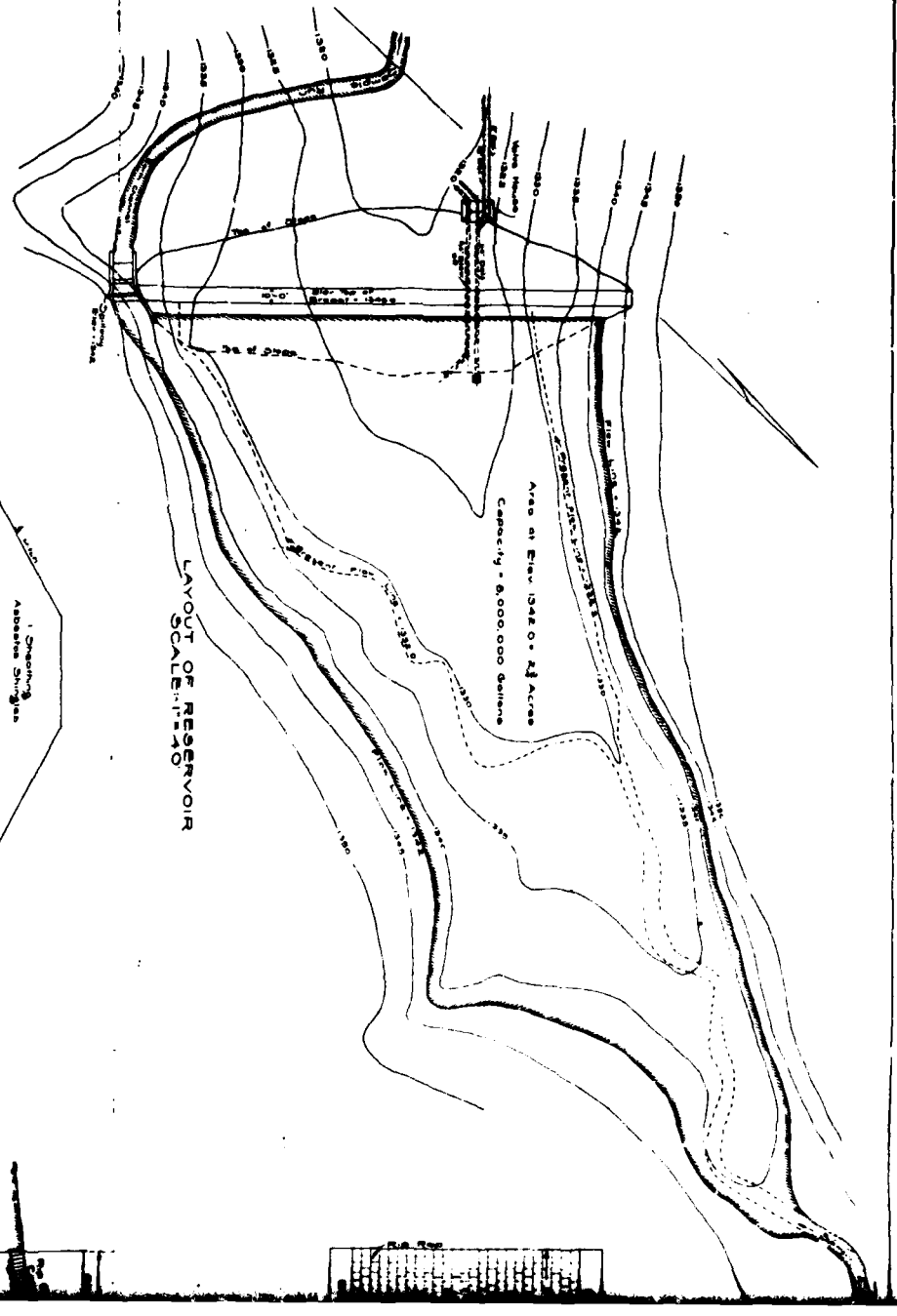
PLATE 3

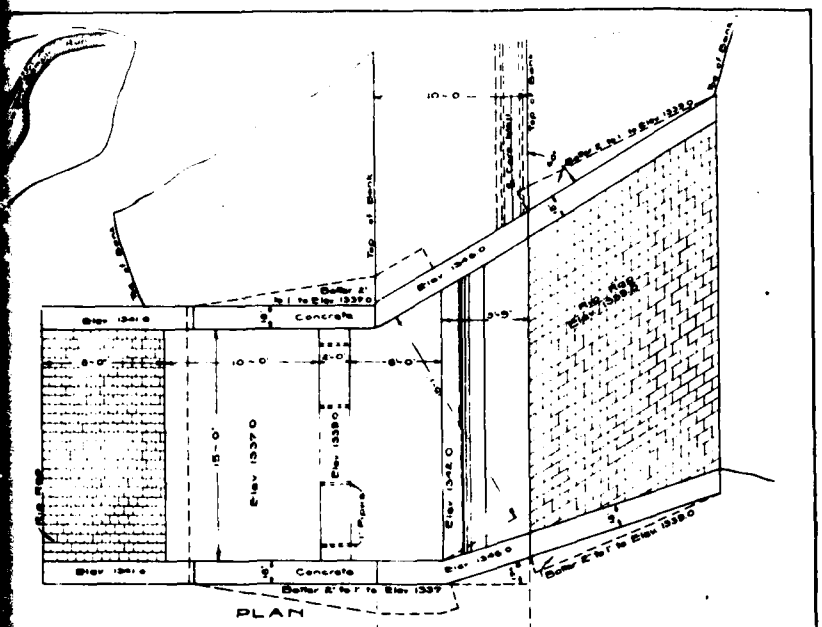
D'APPOLONIA

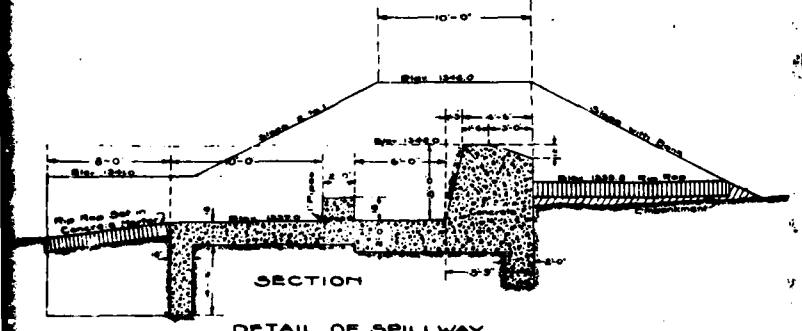
2

DRAWN BY	ACS	CHECKED BY			DRAWING NUMBER 79-543-B36
	11-14-79	APPROVED BY			

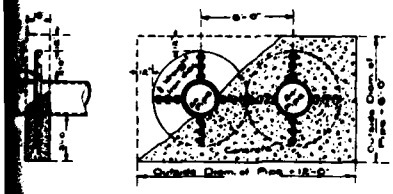




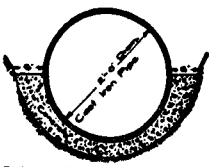




DETAIL OF SPILLWAY



DETAIL OF CUT OFF FOR PIPES



DETAIL OF CONCRETE CRADLE FOR PIPES THROUGH EMBANKMENT
SCALE:- 1" = 1'

LAYOUT AND DETAILS
OF RESERVOIR
FOR POWER PLANT
CLYMER, PA.
CLEARFIELD BITUMINOUS COAL CORP'N
SCALE:- 1/2" = 1' MCH. 1916

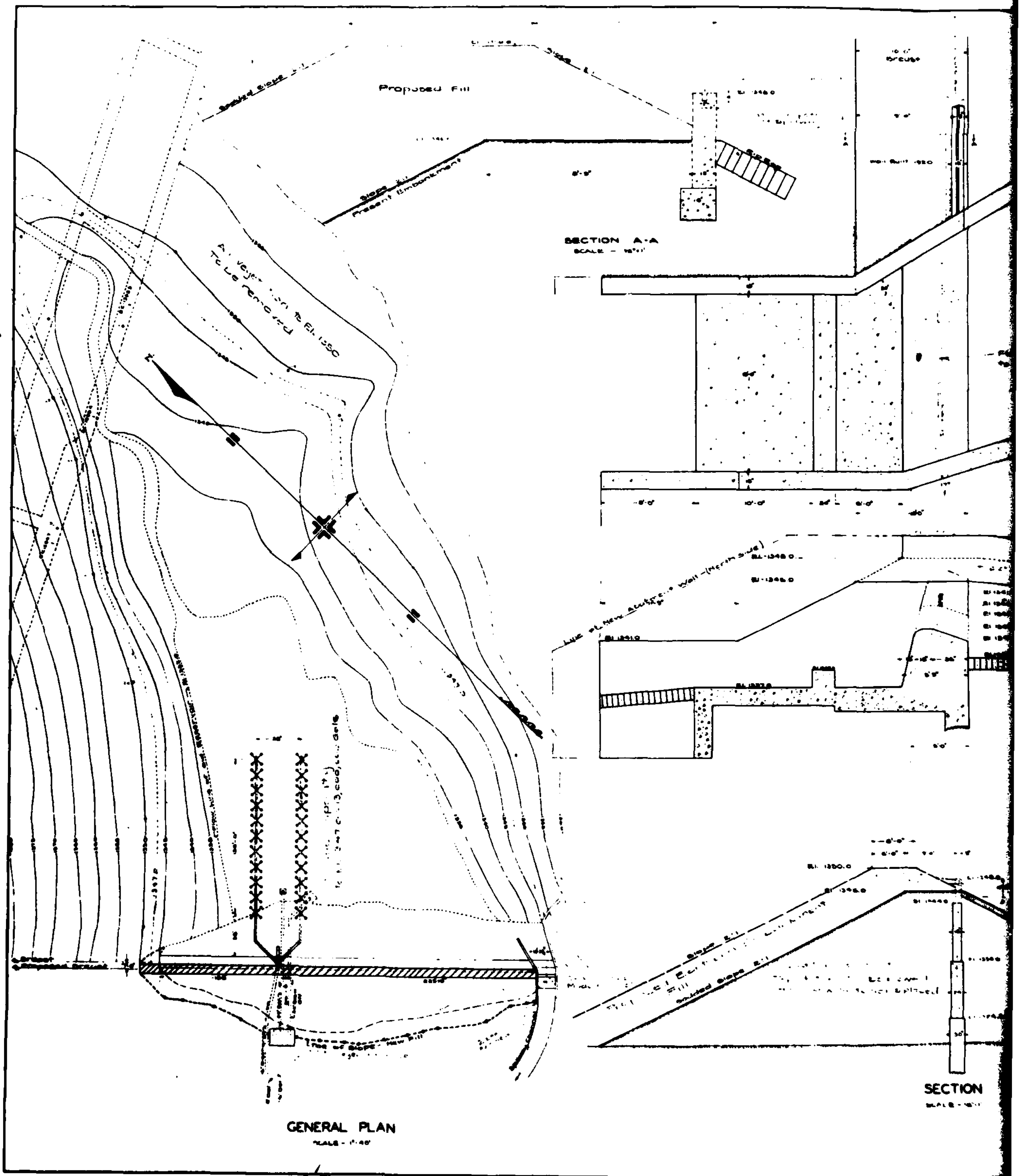
REVISED	6-9-16
REVISED	
REVISED	

DRAWN BY:- F. K. PROSSER
APPROVED:-
3
CHIEF ENGINEER

PLATE 4

D'APPOLONIA

DRAWN BY	ACS	CHECKED BY		DRAWING NUMBER
	11-14-79	APPROVED BY		79-543-B37



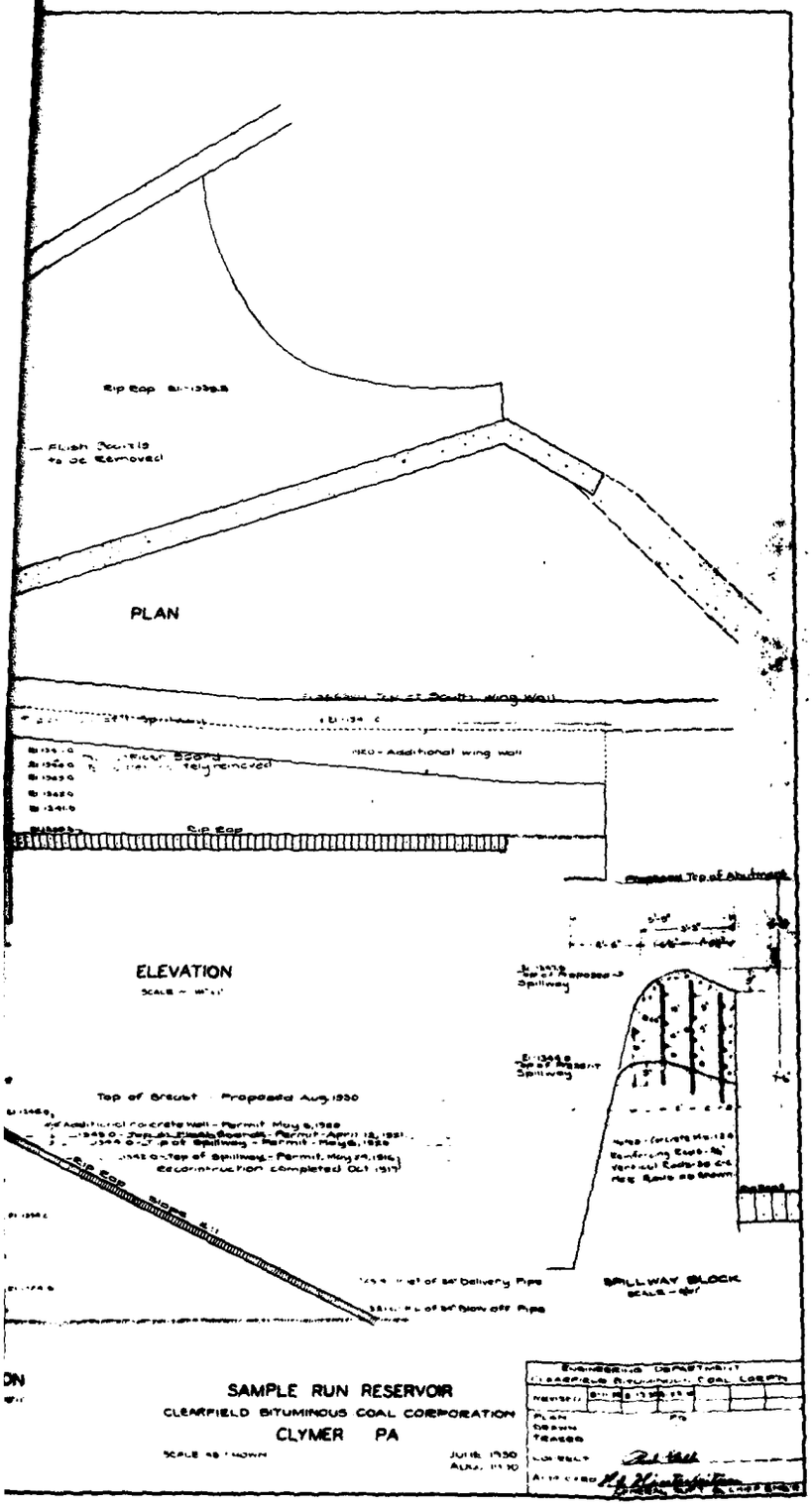


PLATE 5

D'APPOLONIA

2

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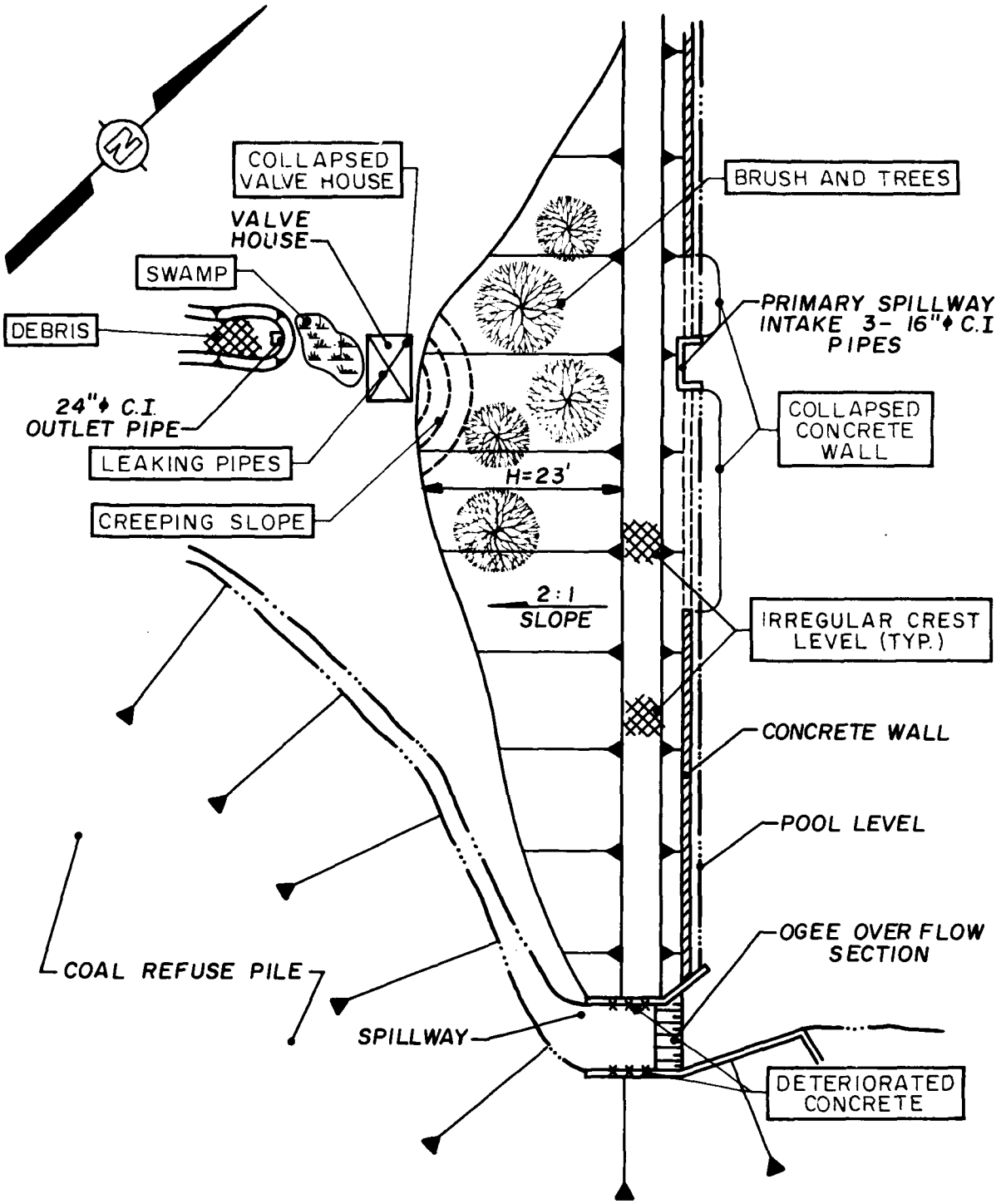
ACS		79-543-A27
11-20-79	APPROVED BY	



NOTES:

1. POOL LEVEL DATE OF INSPECTION: 2.3 FT. DESIGN SPILLWAY CREST LEVEL.

PLATE 6

SAMPLE RUN DAM
GENERAL PLAN
FIELD INSPECTION NOTES
FIELD INSPECTION DATE: NOV. 30, 1979

D'APPOLONIA

NOT TO SCALE

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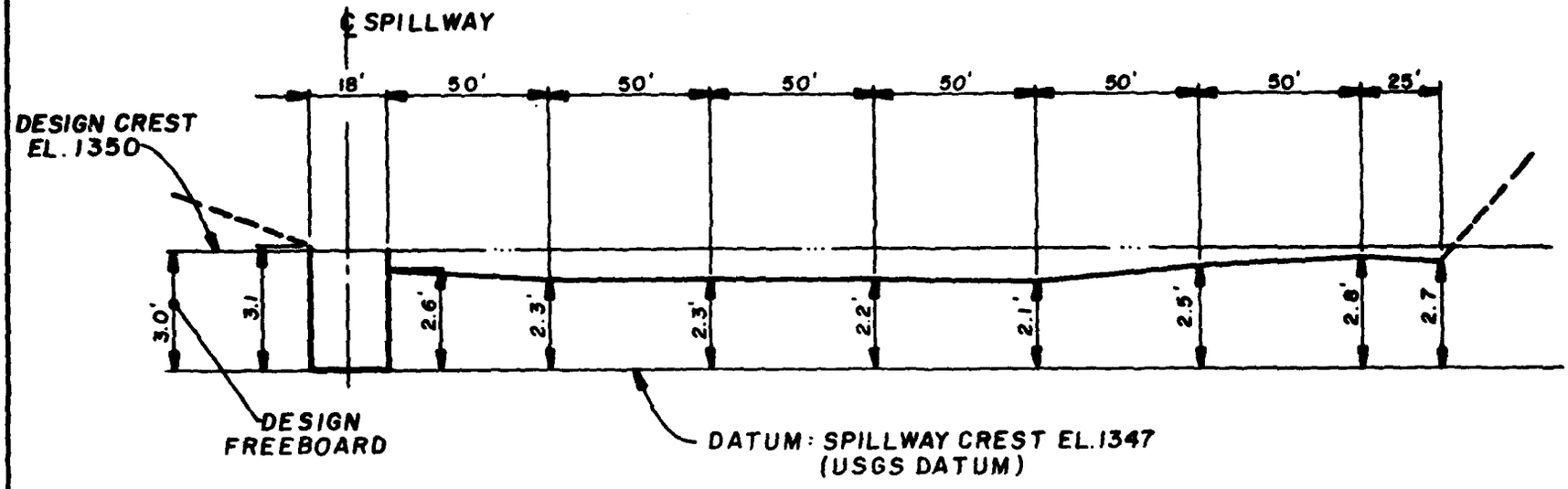
	11-20-79	APPROVED BY	JHP	12/14/79	



DAM CREST PROFILE

(LOOKING DOWNSTREAM)

NOTES:

1. DAM CREST IS SURVEYED RELATIVE TO SPILLWAY CREST LEVEL
2. DATUM ELEVATION PER DESIGN DRAWINGS

SAMPLE RUN DAM
DAM CREST SURVEY
FIELD INSPECTION DATE: NOV. 30, 1979

PLATE 7

DAMTOLONA

APPENDIX F

REGIONAL GEOLOGY

APPENDIX F

REGIONAL GEOLOGY

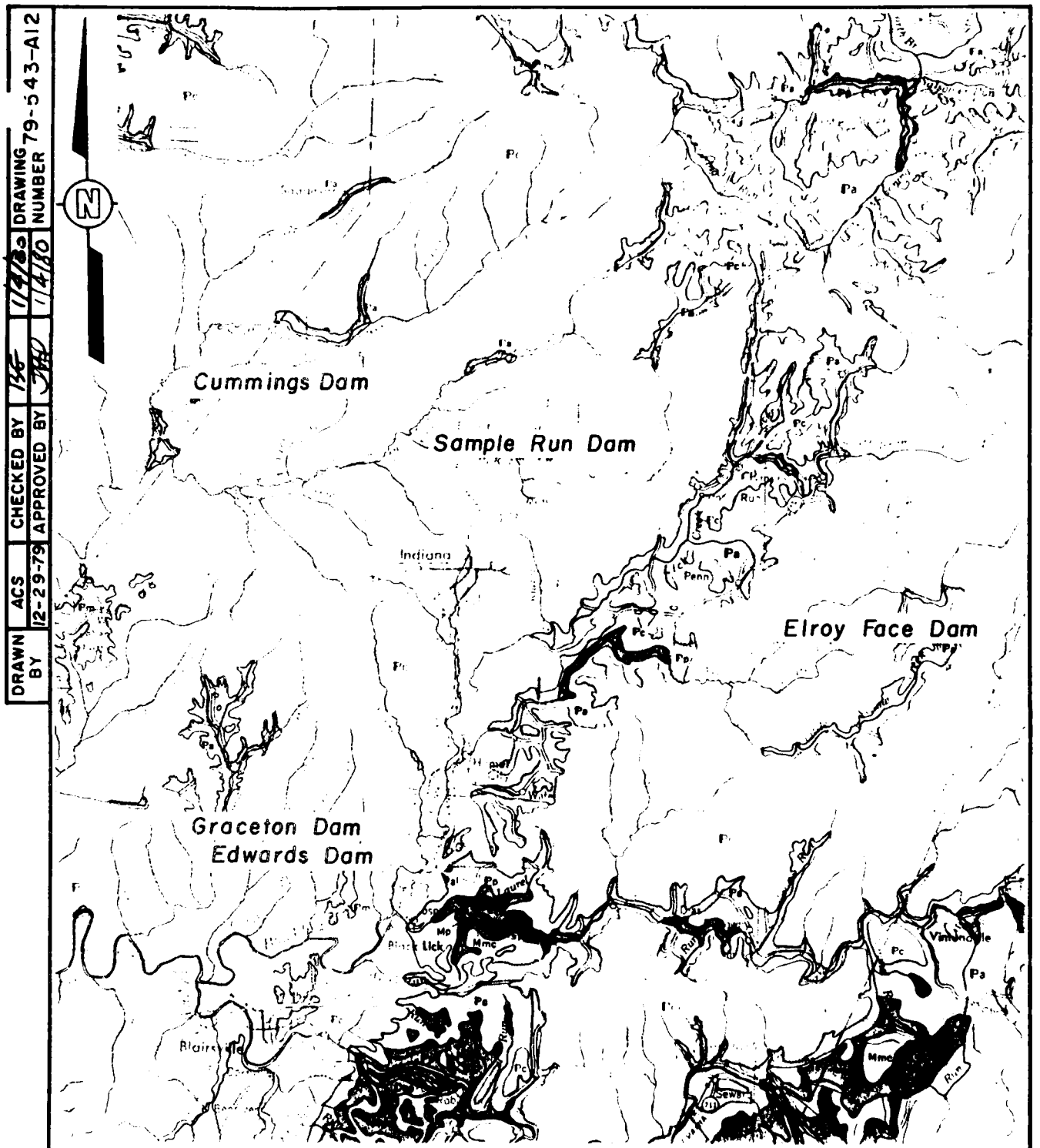
Sample Run Dam is located in the Pittsburgh Plateau section of the Appalachian Plateau Physiographic Province. The area is characterized by rolling topography. The geologic structure consists of gentle folds trending northeast and the site is approximately two miles west of the Chestnut Ridge anticline and two miles east of the Latrobe syncline. The strata dip approximately 200 feet per mile to the northwest. In general, the structural discontinuities trend northwest and northeast.

The reservoir is underlain by strata of the lower part of the Conemaugh Group and the Allegheny Group. The Conemaugh Group in this area consists almost entirely of the Mahoning Sandstone, a thick-bedded sandstone. The strata above the Mahoning Sandstone are predominantly shale and claystone. The Allegheny Group consists of thick sandstone beds, shale beds, and several coal seams and limestone beds. The top of the group, defined by the Upper Freeport coal seam, is approximately 40 feet below the reservoir of the dam.

The Upper Freeport coal seam has been strip mined south of the reservoir. Both the Upper Freeport and Lower Kittanning coal seams are minable in this area. (However, the coal beneath the dam and reservoir does not appear to have been mined.)

It is doubtful that large slides could occur in this area due to the relatively gentle slopes and the presence of thick sandstone beds near the reservoir.

The limestone seams present are thin and discontinuous and do not appear to be subject to solutioning.



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	12-29-79	APPROVED BY		79-543-A12

SCALE

0 2 4 6 8 10 miles

CUMMINGS, SAMPLE RUN, ELROY FACE, GRACETON AND EDWARDS DAMS

GEOLOGY MAP

REFERENCE

GEOLOGIC MAP OF PENNSYLVANIA PREPARED BY COMMONWEALTH OF PENNA., DEPT. OF INTERNAL AFFAIRS, DATED 1960, SCALE 1" = 4 MILES

D'APPOLONIA

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	12-31-79	APPROVED BY	1/14/80	

LEGEND

Pc

Conemaugh Formation

Cyclic sequences of red and gray shales and siltstones with thin limestones and coals; massive Mahoning Sandstone commonly present at base. Ames Limestone present in middle of sections. Brush Creek Limestone in lower part of section

Pottsville Group

Light gray to white, coarse grained sandstones and conglomerates with some variegated shale and thin coals. Sharp Mountain, Schuylkill, and Tumbling Run Formations

Pp

Allegheny Group

Cyclic sequences of sandstone, shale, limestone and coal; numerous commercial coals, limestones thicken westward. Vanport Limestone in lower part of section, includes Freeport, Kittanning, and Clarion Formations

Sc

Clinton Group

Predominantly Rose Hill Formation - Reddish purple to greenish gray, thin to medium bedded fossiliferous shale with interbedding green sandstones and local gray, fossiliferous limestone, above the Rose Hill is brown to white quartzite sandstone (Keefer) interbedded upward with dark gray shale (Rochester)

Dm

Marine beds

Gray to olive brown shales, graywackes, and sandstones contains 'Chemung' beds and Portage beds including Burket, Brallier, Harrell and Trimmers Rock; Tully Limestone at base

Pocono Group

Predominantly gray, locally massive, cross-bedded conglomerate and sandstone with some shale; includes in the Appalachian Plateau Burgoon, Shenango, Cuyahoga, Corry, Cussewago, Corry and Knapp Formations; includes part of "Oswayo" of M. L. Fuller in Potter and Tioga counties

Do

Oriskany Formation

White to brown, fine to coarse grained, partly calcareous, locally conglomeratic, fossiliferous sandstone. Ridgely at the top, dark gray, coarse limestone with some interbedded shales and sandstones below (Shriver)

Tuscarora Formation

White to gray, medium to thick bedded, fine grained, quartzitic sandstone, conglomeratic in part

Marcellus Formation

Black, fissile, carbonaceous shale with thick, brown sandstone (Turkey Ridge) in parts of central Pennsylvania

Onondaga Formation

Greenish blue thin bedded shale and dark blue to black, medium bedded limestone with shale predominant in most places, includes Selinsgrove Limestone and Needmore Shale in central Pennsylvania and Buttermilk Falls Limestone and Esopus Shale in eastern most Pennsylvania, in Lehigh Gap area includes Palmerton Sandstone and Bowmanstown Chert

Dmo

Wills Creek Formation

Greenish gray, thin bedded, fissile shale with local limestone and sandstone zones contains red shale and siltstone in the lower part

Bloomsburg Formation

Red, thin and thick bedded shale and siltstone with local units of sandstone and thin impure limestone, some green shale in places

McKenzie Formation

Greenish gray, thin bedded shale interbedded with gray, thin bedded, fossiliferous limestone, shale predominant at the base, intraformational breccia in the lower part. Absent in Harrisburg quadrangle and to east

Keyser Formation

Dark gray, highly fossiliferous, thick bedded, crystalline to nodular limestone passes into Manlius, Rondout, and Decker Formations in the east

Skt

Tonoloway Formation

Gray, highly laminated, thin bedded, argillaceous limestone, passes into Bossardville and Poxono Island beds in the east

Dck

Catskill Formation

Chiefly red to brownish shales and sandstones, includes gray and greenish sandstone tongues named Elk Mountain, Honesdale, Shohola, and Delaware River in the east

REFERENCE:

GEOLOGIC MAP OF PENNSYLVANIA PREPARED BY COMMONWEALTH OF PENNA. DEPT. OF INTERNAL AFFAIRS, DATED 1960, SCALE 1" = 4 MILES

GEOLOGY MAP LEGEND

D'APPOLONIA

EN

DATE
FILME

6-8

DTIC